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BY

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THE PUBLIC DOMAIN OF THE UNITED STATES.

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INTRODUCTION.

There are within the limits of the United States, exclusive of Alaska and the new island possessions, nearly 573,995,000 acres of vacant Government land, besides 145,122,000 acres in Indian reservations, forest reserves, national parks, reservoir sites, and military reservations, or for some other reason reserved from settlement. The vast area of Alaska, which is very nearly all public land, together with lesser areas in Hawaii, Puerto Rico, and other new dependencies, will bring up the total extent of the national domain, exclusive of reservations, to nearly 1,000,000,000 acres. The table on page 326 shows the distribution of the public land by political divisions, and also compares the amount of public land in each State and Territory with the amount appropriated. The latter includes lands owned by the States and by public and private corporations, as well as all lands either actually owned by individuals, or "entered," though not yet patented, under the land laws of the United States. Since there are in the Western United States some 262,000,000 acres still unsurveyed, the figures given should be taken as being only approximately rather than absolutely correct; and besides the areas shown there are probably a few small isolated tracts of public land remaining undisposed of in Ohio, Indiana, and Illinois. The figures refer to the conditions existing on June 30, 1898, as shown by the report of the Commissioner of the General Land Office, except that corrections and additions have been made for forest reserves set aside since that time, and for the public lands of Hawaii. The table shows that more than 30 per cent of the area of the United States proper is still vacant public land, while about $7\frac{2}{3}$ per cent is reserved.

Future additions to the reservations for permanent forests and reservoir sites will no doubt diminish the area open to settlers, but these additions are likely to be counterbalanced in whole or in part by the opening of Indian and military reservations to settlement. The 1,000,000 acres granted to each of the arid States by the so-called "Carey act" will still further reduce the amount of land to be obtained by settlers directly from the National Government, but doubtless without reducing the total amount of public land available for settlement. At the present rate of disposal to individuals, the vacant lands in the United States proper would last for nearly a century.

Areas of vacant, reserved, and appropriated lands.

States and Territories.	Unappropriated and unreserved.		Reserved.		Total Government land.		Appropriated.		Total.
	Acres.	Per cent.	Acres.	Per cent.	Acres.	Per cent.	Acres.	Per cent.	
Alabama.....	522,373	1.60	86,240	0.26	608,613	1.86	32,049,387	98.14	33,658,000
Arizona.....	51,734,783	71.07	1,572,282	21.12	53,307,065	92.19	3,685,455	7.81	57,992,520
Arkansas.....	3,696,990	11.02	1,920	.01	3,698,910	11.03	23,844,500	88.97	27,543,400
California.....	42,443,023	42.72	1,162,470	1.35	43,605,493	59.07	40,685,890	40.93	84,291,383
Colorado.....	39,708,551	59.81	6,225,533	9.38	45,934,084	69.19	20,450,666	30.81	66,384,750
Florida.....	1,757,275	4.98	19,840	.06	1,777,115	5.04	33,487,385	94.96	35,264,500
Idaho.....	44,207,949	83.68	1,939,869	3.67	46,147,818	87.35	6,682,382	12.65	52,830,200
Indian Territory.....	1,060,883	2.02	19,575,040	100.00	20,635,923	100.00	50,334,242	99.09	71,575,040
Kansas.....	755,545	2.62	987,875	1.89	1,743,420	3.51	23,632,809	92.27	25,386,224
Louisiana.....	505,895	1.37	1,474,834	5.11	2,000,729	7.73	36,225,359	98.39	38,226,088
Michigan.....	5,720,326	11.07	87,746	.24	5,808,072	1.61	40,985,705	79.29	46,793,777
Minnesota.....	383,950	1.29	4,983,409	9.64	5,367,359	20.71	29,301,050	98.71	34,668,409
Mississippi.....	445,911	1.02			10,703,735	1.29	29,301,050	98.71	30,346,766
Missouri.....	71,507,296	75.13	1,464,533	1.53	73,000,000	1.02	43,350,089	98.98	116,350,089
Montana.....	10,548,450	21.47	70,532	.14	10,618,982	87.16	12,227,891	12.84	22,846,873
Nebraska.....	61,555,609	87.23	5,983,409	8.51	67,539,018	95.74	3,994,482	4.26	71,533,500
Nevada.....	54,550,795	69.76	8,356,488	10.69	62,907,283	80.45	15,289,722	19.55	78,197,005
New Mexico.....	20,574,613	45.82	3,060,610	6.79	23,635,223	52.61	21,277,764	47.39	44,912,987
North Dakota.....	7,007,222	28.31	7,207,160	29.11	14,214,382	57.42	10,538,281	42.58	24,752,663
Oklahoma.....	35,897,869	58.25	5,467,702	8.87	41,365,571	69.12	20,360,647	32.88	61,726,218
Oregon.....	12,784,426	26.55	1,120,906	2.39	13,905,332	93.80	3,258,657	6.20	17,163,989
South Dakota.....	43,870,036	83.49	1,451,307	10.37	45,321,343	93.80	18,110,157	42.43	63,431,490
Utah.....	13,442,532	31.49	11,131,345	26.08	24,573,877	2.21	34,495,848	97.79	59,069,725
Washington.....	413,799	1.17	365,353	1.04	779,152	.04	5,180,694	8.30	5,960,846
Wisconsin.....	49,035,663	78.54	232,119	.04	49,267,782	.04	578,791,910	99.96	627,059,694
Wyoming.....									
Other States.....									
Total.....	573,994,884	30.21	145,121,835	7.64	719,116,719	37.85	1,180,902,532	62.15	1,900,019,251
Alaska.....	389,826,041	300.00	(4)		389,826,041	300.00	3,559		389,829,599
Hawaii.....	1,772,640	41.71			1,772,640	41.71	2,476,960	58.29	4,249,600
Total ¹	945,293,515	41.57			1,090,415,350	47.96	71,183,383,051	52.04	2,273,798,401

¹ Including forest reserves withdrawn from entry since July 1, 1898. ² Land area of Ohio, Indiana, Illinois, and Iowa, formerly public-land States, as given in the General Land Office reports, 117,913,632 acres; land area of eighteen Eastern States, the District of Columbia, and Texas, according to the Eleventh Census, 461,110,400 acres. ³ Nearly. ⁴ Area unknown. ⁵ Including leased lands. ⁶ Exclusive of Puerto Rico, Guam, and the Philippine Islands. ⁷ Total area disposed of by the National Government, 720,027,810 acres, including 3,559 acres in Alaska.

In the case of land grants in aid of railroad construction, lands within the limits of the grants are considered "unappropriated and unreserved" until selected by the grantee, though it is not certain that the usage of the various land offices is uniform in this respect. It follows from this mode of classification that to ascertain the amount of land still available for entry a deduction should be made from the amount given as "unappropriated and unreserved" to represent that portion of railroad grants not yet selected by the railroad companies. While no exact figures are available for this purpose, the General Land Office estimates the total amount of land granted to aid in railroad construction at 156,893,468 acres, and as the amount patented up to July 1, 1898, was but 88,947,862 acres, the remainder is a little less than 68,000,000 acres. It is, however, very unlikely that patents will actually issue to the grantees for half that quantity of land, for some portions of the grants had been appropriated by settlers before the grants were made, and still larger areas are so mountainous and barren as to be scarcely worth selecting and patenting. A deduction of 25,000,000 acres from the area unappropriated and unreserved would probably be sufficient to cover future patents on account of railroad land grants. These grants consist of the alternate sections lying within wide strips of territory crossing the western part of the United States, and in some cases indemnity lands have been granted beyond the limits of the original grants. The Northern Pacific Railroad grant extends in a band 40 miles wide across Minnesota and 80 miles wide across North Dakota, Montana, the northern end of Idaho, and Washington; the Union Pacific and Central Pacific Railroad grants are in a strip 40 miles wide extending from the Missouri River across Nebraska, southern Wyoming, northwestern Utah, Nevada, and California, to San Francisco, with branches in Colorado and Kansas and northward through California and Oregon; the Atlantic and Pacific and Southern Pacific Railroad grants extend from the Rio Grande in New Mexico across Arizona and California to San Jose, with a branch to the southeastern corner of California. There are also many smaller grants in the more easterly public-land States, besides several wagon-road grants in Oregon and elsewhere.

PUBLIC LANDS FIT FOR PRODUCTIVE USES.

Far more important than the exact area of the public domain legally open to settlement is the question how much of this public land is actually fit for cultivation or for other productive uses. Having regard to present conditions, it must be admitted that all the best parts of the public domain have been appropriated, and that comparatively very little good agricultural land remains open to settlement; the mineral value of that which remains may be very great, but even of the mineral deposits it may be said that the most accessible and

most easily worked among them have probably been appropriated. Looking into the future, the question becomes much more difficult, for no one can tell even approximately how much of the land now lying waste may be ultimately reclaimed to productive uses. The one thing needed, as far as concerns the greater part of the 573,995,000 acres of vacant public land in the United States proper, including nearly all west of the ninety-eighth or one hundredth meridian, is an adequate supply of water; and this applies to much of the mineral land, as well as to that which it is desired to reclaim for agricultural purposes. Vast tracts of arid land in the Western United States contain in an unusual degree all the elements of fertility except water, and with the aid of irrigation could be made to yield more abundantly than even the best land of the humid regions. It has been said that "sagebrush is unerring evidence of kindly soil and abundant sunshine."

Estimates of the amount of this land which can be irrigated with the water at command vary greatly, but there is none for the arid region as a whole more authoritative than those of Maj. J. W. Powell, formerly Director of the United States Geological Survey, and Mr. F. H. Newell, chief hydrographer of that Survey. Major Powell estimated that at least 150,000 square miles, or 96,000,000 acres, could be economically reclaimed by irrigation within the present generation; or, as he said before a Congressional committee in 1890, that about 100,000,000 acres could be reclaimed by the utilization of perennial streams alone.¹ Mr. Newell places the irrigable amount at 74,000,000 acres,² or about 7.6 per cent of the total area of the sixteen Western public-land States and Territories. This is a very conservative estimate, in which financial as well as engineering considerations are taken into account, and it looks not to the remote future, but only to what is likely to be profitable and therefore practicable within a generation. Future improvements in irrigation engineering and methods and discoveries of new underground water supplies, together with the increasing demand for agricultural products resulting from an increasing population, may in the course of time make it profitable to irrigate a much larger area; but any attempt to state the ultimate extent of irrigation would be only conjecture. The amount of land irrigated in 1889, the latest year for which census figures are available, was in most of the arid States so small in proportion to the estimated irrigable area as to be almost negligible in a rough calculation, so that it will not be far from the truth to take Mr. Newell's conservative figures as representing the probable future increase of the irrigated area. But it must be remembered that some part of the lands to be reclaimed will probably be lands now in private ownership. Although the area

¹ First Annual Report of the United States Irrigation Survey, 1888-89, pp. VII, 14; Second Annual Report of same, 1889-90, p. 204.

² The Public Lands and their Water Supply. (Extract from the Sixteenth Annual Report of the United States Geological Survey, 1894-95, p. 494.)

now irrigated is very small as compared with the total irrigable area, the canals and ditches already constructed take most of the water which is easily obtainable, and the future development of the West depends mainly upon the construction of storage reservoirs and large canals, or other difficult and expensive undertakings which are beyond the power of individuals or small groups of individuals. Much will therefore depend upon the policy adopted for attracting capital to the irrigation industry. It is evident that the work of reclamation must be undertaken either by public agencies or by large corporations.

PUBLIC RESERVATIONS.

As shown by the table following, the land reserved from settlement consists mainly of Indian reservations and forest reserves; but there are also numerous military reservations and reservoir sites, seven national parks, some unconfirmed Spanish and Mexican private land grants in New Mexico and Colorado, and probably some unpatented portions of grants in aid of railroads, which are included in the area reserved. The figures given under the head of "Forest reserves" include some small areas which do not really belong to the reserves, though included within their boundaries. The "reservoir sites" do not include all sites selected by the United States Geological Survey, but only lands actually withdrawn from settlement. The area of the military reservations in the public-land States and Territories, as shown by the records of the General Land Office, is 786,838 acres; but according to a recent compilation made in the Judge-Advocate-General's Office, which includes national cemeteries and military parks and reservations purchased by the Government as well as those reserved from the public domain, the total area for those States and Territories is more than 835,000 acres. The General Land Office figures are here given for the public-land States, however, as the areas of some of the smaller reservations are unobtainable from any source, and the figures are thus made comparable with those given in former General Land Office reports and in the Sixteenth Annual Report of the United States Geological Survey. The comparison shows that the area devoted to military reservations in the Western States has been diminished by one-half within three or four years. Illinois, which the General Land Office report still treats as a public-land State and credits with 750 acres, is here included among "other States." The table does not include grounds occupied by public buildings in the District of Columbia and elsewhere; nor does it include the Afognak Forest and Fish-Culture Reserve, the military reservation at Fort St. Michaels, or any of the other reservations in Alaska. It is impossible to make the total agree with the total "area reserved" as given in the General Land Office report, because in several Commonwealths the sum of the areas of the Indian, forest, and military reservations alone is greater than the area given by the General Land Office as reserved.

Classification of lands reserved from settlement in the United States proper.

States and Territories.	Indian reservations.	Forest reserves.	National parks.	Reservoir sites.	Military reservations.	Other reserved land.	Total.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Alabama.....					¹ 1,950	84,290	86,240
Arizona.....	15,150,757	4,496,000	² 480	3,960	101,412		19,752,609
Arkansas.....			³ 912		15	998	1,920
California.....	406,556	8,571,794	⁴ 1,130,240	3,463	86,907	6,050,210	16,249,170
Colorado.....	1,021,230	3,103,360		33,875		2,067,068	6,225,533
Florida.....					15,573	4,267	19,840
Idaho.....	1,364,500	4,008,960	⁵ 38,400	1,561	1,925		5,415,346
Indian Territory.....	19,575,040						19,575,040
Kansas.....	28,279				22,649	936,947	987,875
Louisiana.....					1,515	1,473,319	1,474,834
Michigan.....	5,944				2,728	79,074	87,746
Minnesota.....	1,565,606				7	3,417,796	4,983,409
Mississippi.....							
Missouri.....					1,000		1,000
Montana.....	9,382,400	5,040,000	⁵ 118,400	33,201	257,344		14,831,345
Nebraska.....	124,053				56,719		180,772
Nevada.....	954,135					5,029,274	5,983,409
New Mexico.....	1,667,485	2,758,080		25,179	159,240	3,746,504	8,356,488
North Dakota.....	3,782,347						3,782,347
Oklahoma.....	6,949,715				26,880	230,565	7,207,160
Oregon.....	1,484,039	4,653,440			1,945		6,139,424
South Dakota.....	9,835,781	1,166,080			11,185	107,860	11,120,906
Utah.....	3,972,480	943,360		139,712	8,957	386,798	5,451,307
Washington.....	3,874,324	7,902,720	⁷ 207,360		18,633		12,003,037
Wisconsin.....	393,177				1,046		394,223
Wyoming.....	1,810,000	3,241,760	⁵ 1,897,000		8,458	1,259,425	8,216,643
Other States.....	⁸ 188,853				⁹ 43,266		232,119
Total.....	83,536,701	45,885,554	3,892,792	240,951	829,354	24,874,390	158,759,742

¹ Including a reservation partly in Mississippi.² Casa Grande Ruin.³ Hot Springs Reservation.⁴ Sequoia, Yosemite, and General Grant National parks.⁵ Part of the Yellowstone National Park.⁶ Area according to the Commissioner of Indian Affairs, 19,822,888 acres.⁷ Mount Ranier National Park, created by act of March 2, 1899.⁸ New York, North Carolina, and Iowa.⁹ Connecticut, Delaware, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, and Virginia.

THE CHARACTER OF THE PUBLIC LANDS.

The table on page 331 gives approximately the areas of forest and woodland, grazing lands, and desert composing the public domain in fifteen Western States and Territories. It is based upon the estimates of Mr. F. H. Newell,¹ which show that of 609,000,000 acres of land vacant in these States and Territories in 1894 there were about 166,000,000 acres of forest and woodland, 374,000,000 acres of grazing land, and 69,000,000 acres of desert, or land too barren even for grazing.

¹ Sixteenth Annual Report of the United States Geological Survey (1894-95), p. 494.

Making allowance for the forest reserves which have been set aside since that time, and also for some areas which have been opened for settlement, and estimating the probable division of lands entered by settlers between timber and grazing land, the land now unappropriated and unreserved is found to consist of about 124,300,000 acres of forest and woodland and 365,400,000 acres of grazing land, with nearly or quite as much desert land as before.

Character of the vacant public lands in fifteen Western States and Territories.

States and Territories.	Woodland and forest.	Grazing land.	Desert.	Total.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona	6,900,000	29,800,000	15,000,000	51,700,000
California	900,000	22,500,000	19,000,000	42,400,000
Colorado	10,500,000	29,200,000	-----	39,700,000
Idaho	24,600,000	19,600,000	-----	44,200,000
Montana	19,800,000	51,800,000	-----	71,600,000
Nebraska	-----	10,500,000	-----	10,500,000
Nevada	800,000	40,600,000	20,000,000	61,400,000
New Mexico	8,600,000	46,000,000	-----	54,600,000
North Dakota	200,000	20,400,000	-----	20,600,000
Oklahoma	-----	7,000,000	-----	7,000,000
Oregon	19,200,000	16,700,000	-----	35,900,000
South Dakota	-----	12,800,000	-----	12,800,000
Utah	17,000,000	16,900,000	10,000,000	43,900,000
Washington	7,100,000	6,300,000	-----	13,400,000
Wyoming	8,700,000	35,300,000	5,000,000	49,000,000
Total	124,300,000	365,400,000	69,000,000	558,700,000

In the present paper the public domain is briefly described by States and Territories (arranged in the order of the extent of public lands in each, except that Kansas is treated with the other Western States), with special reference to the amount of public land which can probably be made available for agricultural purposes. In discussing the possibilities of the arid region, Mr. Newell's estimates of the available water supply are adopted, but in some cases other estimates are given also for the sake of comparison. It will be observed that estimates made by local engineers are usually, though not in every case, considerably larger than those of Mr. Newell. The other data given are also taken almost wholly from official sources, including State and national publications. It should be borne in mind that the vacant public lands are not wholly unused at the present time, for grazing is permitted upon them without restraint, and thus they furnish sustenance to a vast number of sheep, cattle, and horses; but the area of good grazing land belonging to the public domain is in some localities being rapidly diminished by overstocking and too close grazing.

MONTANA.

About three-fourths of the total area of Montana, or 71,567,000 acres, is still vacant public land, mainly unsurveyed. Including reservations of all kinds, about 87 per-cent of the State belongs to the

public domain. Little has been appropriated, except along the rivers, and even of the land so situated there is some still vacant. The greater part of the public land consists of mountain ranges, partly covered with forests, and arid plains, useful in their present condition only for grazing; but some vacant agricultural land is reported in nearly every section of the State except in the westernmost counties. More than 1,000,000 acres of "good farm land" are reported by the General Land Office in Carbon, Gallatin, and Park counties alone. Mr. Newell estimates that with the water supply now available a total area of about 11,000,000 acres can be irrigated. This is a little less than the amount already disposed of by the Government, but as much of the latter will probably remain unwatered, the area ultimately irrigated will doubtless include large tracts of what is now public land. The amount of irrigable land might be considerably increased by the construction of large canals to take water from the Missouri and Yellowstone rivers, but these flow so far below the surface of the plains to be watered that the expense would be very great. Much will depend upon the possibility of storing the spring floods; but according to the most hopeful view of the case, about one-fifth of the State is reclaimable from its arid condition. The opportunity for irrigation seems especially favorable in the southeastern part of the State, in the Yellowstone basin, the Yellowstone and Big Horn rivers carrying an amount of water in excess of any probable demand. The greater part of the State, however, lies within the Missouri basin, where perhaps 1,000,000 acres may be irrigated by an economical use of the water supply. This central portion of the State is nearly all between 2,000 and 7,000 feet above the sea, the greater part having an altitude of about 3,000 or 4,000 feet. In the western end of the State are vast areas of forest and woodland, partly on the mountains.

The climate of Montana is mild for the high latitude, and one of its features is an early spring. The agricultural products which are grown most extensively are hay, oats, wheat, barley, potatoes, and vegetables. Apples and other hardy fruits are also raised successfully. The principal industries of the State thus far, however, are mining and stock raising. The mountains in the western part of the State are rich in both precious and base metals, while coal is found also in several places farther east. Transportation facilities are provided by the Northern Pacific and Great Northern railroads, which traverse the State from east to west, with a few branch lines in the western half, and by a branch of the Union Pacific system from Idaho. The Northern Pacific Railroad land grant extends in a broad curve from the eastern boundary to the northwestern corner of the State.

NEVADA.

The vacant public land of Nevada amounts to about 61,358,000 acres, or very nearly seven-eighths of the total area—a larger proportion than in any other State. There are in addition nearly 6,000,000 acres

reserved from settlement. Of the 3,000,000 acres or less no longer in the hands of the National Government, by far the greater part is included in a 2,000,000-acre grant to the State for the support of common schools, and in minor grants for various other purposes. The amount taken up by individuals is therefore a very small proportion of the State's surface, and it is scattered in small tracts along the borders of streams, the only considerable areas being in the western corner of the State, near Lake Tahoe. The vacant public land is described in the General Land Office report as mountainous, arid, grazing land, with little or no timber; but it appears to include also the greater part of numerous small valleys lying between the mountain ranges.

Nevada forms most of the western and central part of the Great Basin, and with the exception of small areas in the northeast and southeast, contributes no water to the ocean. The streams either flow into saline lakes or are dissipated by evaporation and by sinking into the ground before forming any considerable bodies of water.

The surface of the State is a diversified plateau, and, exclusive of mountain peaks, ranges in altitude from 800 feet in the southeast to 7,000 feet in the northeast. The variations in altitude, together with the great length of the State from north to south, make the climate suitable for the production both of semitropical fruits and of the grains and fruits of the temperate zone. As yet, however, Nevada's agricultural possibilities have scarcely begun to be developed.

Nevada is often referred to as the most arid State in the Union, yet the water supply will undoubtedly be found sufficient to reclaim a large extent of land near the streams and springs, but now forming part of the desert. The United States Geological Survey's estimate of the amount of irrigable land in Nevada is only 2,000,000 acres. In 1889 the State board of reclamation and internal improvements estimated the amount at 12,000,000 acres. According to the estimate of the Nevada commission of the National Irrigation Congress, of which the State surveyor-general was chairman, Nevada has about 6,000,000 acres of arable land capable of irrigation, this estimate being made on the basis of 1 acre-foot of water to an acre, permitting the application of water amounting to 12 inches in depth each year. The possible sources of this water supply are given as follows:

Sources of water supply for irrigation.

	Acre-feet.
Truckee, Carson, and Walker rivers	1, 000, 000
Humboldt River	1, 000, 000
Salmon, Bruneau, and Owyhee rivers	400, 000
Quinn River	175, 000
Rio Virgin	100, 000
Small streams and springs	2, 411, 000
Total surface waters	5, 086, 000
Subsurface supply, say	914, 000
Total	6, 000, 000

The utilization of the amount of water indicated involves extensive storage of spring floods in reservoirs, as well as the use of underground waters where possible. There are many natural reservoir sites along the principal streams, consisting of the beds of ancient lakes or other depressions, a number of which have been reserved by the National Government for reservoir purposes. In some cases the amount of water which can be retained in reservoir sites already known is greater than is needed for the arable land within reach. Artesian waters have been obtained in some parts of the State, but not in large quantities. Springs are numerous, but in some cases contain too much mineral matter to be available for irrigation. In the Humboldt Basin the amount of land which has already been alienated, including that granted to the Central Pacific Railroad, is greater than can probably be irrigated; but in the remainder of the State the area estimated to be irrigable, even excluding underground supplies, is greater than the amount which has been patented. Agriculture without irrigation can not be carried on except in a few of the lower valleys.

Thus far the principal industries of Nevada have been stock raising, carried on largely on the public lands, and mining. The silver mines which made the State famous still contain quantities of fairly good ore, and it has recently begun to be questioned whether Nevada is not as much a gold as a silver State. Several less precious metals are also found, as well as a variety of other mineral substances, including coal, granite, sulphur, gypsum, alum, niter, borax, soda, salt, chalk, soapstone, and mineral soap. But the mining interests, as well as the agricultural, suffer at present from lack of adequate transportation facilities.

NEW MEXICO.

New Mexico has about 54,550,000 acres of public land open to settlement, 8,356,000 acres which are reserved for various purposes, and 15,290,000 which have been appropriated. Most of the land in private ownership consists of large private land grants from the Spanish and Mexican governments, but recognized by patents from the General Land Office. Vast tracts of land remain undisposed of in the eastern and southern parts of the Territory, and to a less extent in the north-western corner, just east of the Navajo Indian Reservation. This land consists of both mountains and arid plains, some portions of which are too arid even for grazing. There is some timber scattered through the Territory, and minerals exist in the mountains in great variety and in unknown quantities.

For its water supply New Mexico is dependent upon the Rio Grande and the Pecos with their tributaries, the Canadian River in the northeast, and a few smaller streams which rise near the western boundary and cross it on their way to the Colorado. The Rio Grande and its tributaries are so far below the level of the surrounding country as to be unavailable for irrigation except to a limited extent where the canyons widen out into narrow valleys. There are many

good reservoir sites, and it is estimated that about 4,000,000 acres can be irrigated with the aid of sufficient capital. Wells have been fairly successful in various parts of the Territory.

Alfalfa, wheat, oats, barley, Kafir corn, and sugar beets are among the important crops of New Mexico. The climate seems to be especially well adapted also to fruit raising. Throughout most of the Territory, however, the raising of sheep and cattle will doubtless continue to be the chief industry. The Territory is traversed by a number of railroads, and along the Rio Grande Valley especially the transportation facilities are good.

ARIZONA.

Arizona contains 51,734,000 acres of Government land open to settlement, besides several large reservations for the use of Indians and for other purposes. Only about 5,685,000 acres have passed out of the hands of the Government. The vacant public lands are variously described as mountainous, broken, arid, grazing, and timber lands. It is estimated that nearly one-half the total area of the Territory is excellent grazing land, and the climate is favorable for stock raising, which thus far has been a more important industry than the raising of crops. The cultivation of the soil by the aid of irrigation is coming to be of more and more importance, however, especially in the valleys of the Gila and Salt rivers, which are supposed to have been used in the same way by some prehistoric people. New canals in course of construction in these valleys are expected to water considerable areas of what is now public land. It is thought that a single large dam can be constructed which will hold back enough water to irrigate all the vacant land in the Salt River Valley, the soil of which has been found on analysis to be richer than that of the Nile. The Colorado River, which flows through the northern part of the Territory and forms its western boundary, is confined in such deep canyons that it is impossible to divert its waters, except in the extreme southwest, where it is hoped that a sufficiently long canal will bring them out upon the plains. Mr. Newell estimates the amount of land in Arizona reclaimable in the near future without too great expense at 2,000,000 acres, but the irrigation engineer of the Arizona Experiment Station has estimated that more than 6,000,000 acres can be irrigated in the Gila and Salt River valleys alone, and that by utilizing all the reservoir sites in the Territory at least one-fourth of its entire area could be reclaimed.

The northern and eastern part of the Territory is a high plateau, bordered and marked off from the lower lands of the south and west by abrupt precipices, and covered for the most part by an immense forest, mainly of yellow pine. Although Arizona as a whole is one of the most arid sections of the country, there are some places on the plateau and in the valleys among the mountains where agriculture is carried on without irrigation. The diversity of climate is so great that the products include both the grains of the temperate zone and

semitemperal fruits—oranges, lemons, figs, raisins, dates, almonds, olives, and bananas being raised successfully and ripening a month or six weeks earlier than in any other part of the United States. Successful experiments have been made in raising sugar beets and canaigre, and in the Salt River Valley strawberries are said to ripen every month in the year. The most important staple crop continues to be alfalfa, which supplies the elements most lacking in the soil. There are mines of copper, gold, and silver, and a variety of other mineral deposits.

Arizona is traversed by the Southern Pacific Railroad near the Mexican boundary and by the Atlantic and Pacific farther north, and these two trunk lines are connected and supplemented by local railways.

UTAH.

In Utah there are 43,870,000 acres of unappropriated public land, more than three-fourths of which is still unsurveyed. Two large Indian reservations, together with smaller amounts of land reserved for other purposes, swell the total of Government land in the State to 49,321,000 acres, the amount appropriated being only 3,259,000 acres. The public lands which are open to settlement are partly mountainous, and practically all the remainder is so arid as to require irrigation to fit it for agricultural uses. There are only a few places in the State where "dry farming" has been at all successful.

The western half of Utah forms the eastern part of the Great Basin, and includes an arid region southwest of Great Salt Lake known as the Great American Desert, while the portion of the State lying east of the Wasatch Mountains drains into the Colorado River and its tributaries. More than half the area of the State is from 4,000 to 6,000 feet above sea level, and nearly all the remainder lies still higher, many mountains exceeding an altitude of 10,000 feet. The rugged contour of the country leaves many excellent reservoir sites which can be utilized without great expense. Besides the works already constructed, seven or eight reservoirs definitely projected are designed to reclaim more than 100,000 acres of land now lying waste, and there are several other reservoir sites selected as such by the United States Geological Survey. The water supply of Utah, according to Mr. Newell's estimate, would be sufficient, with a good system of storage, to irrigate 4,000,000 acres; the estimate of the Utah commission of the National Irrigation Congress was 3,654,000 acres, divided as follows:

Sources of water supply for irrigation.

	Acres.
Salt Lake drainage system.....	2,155,520
Colorado drainage system proper.....	1,117,180
Sevier Valley drainage system	283,500
Southwestern drainage system	97,800
Total.....	3,654,000

About 1,350,000 acres of this irrigable land are on the Indian reservations, where agriculture is already carried on by means of irrigation; and altogether something over 1,000,000 acres of the irrigable land in the State are already under ditch,¹ this being about one-third of the amount of land in private ownership. The lands ceded to the State on its admission to the Union include about 1,304,000 acres of the irrigable land, so that after a million acres have been reclaimed under the Carey act there will be little, if any, irrigable land to be obtained by settlers directly from the National Government.

Among the more important agricultural products of Utah are alfalfa, wheat and other cereals, sugar beets; garden produce, and fruits, including especially apples, pears, peaches, plums, and grapes. Stock raising and mining are among the leading industries.

The Union Pacific and Central Pacific railways meet in the northern part of the State, reaching thence north and south by means of the Oregon Short Line, while the Rio Grande Western extends from Ogden and Salt Lake southeastward, with short branches in various other directions.

IDAHO.

The public land still open to settlement in Idaho amounts to 44,207,000 acres, or nearly 84 per cent of the entire area of the State. It consists mainly of forest-covered mountains in the northern and central portions of the State, and farther south, of lava plains on which the sagebrush grows luxuriantly; but some vacant agricultural land is reported among the mountains in the northernmost counties, where dry farming is successfully carried on.

Idaho lies to the west and south of the Bitter Root Mountains, the Snake River traversing its broad southern end and forming part of its western boundary, where it is joined by the Boise, the Payette, the Weiser, the Salmon, and the Clearwater. There is thus, on the whole, a large and well-distributed water supply, but the largest rivers, the Snake, Salmon, and Clearwater, are for the most part considerably below the level of the surrounding country. In the Snake Valley is one of the largest tracts of irrigable land in the West, but its reclamation as a whole will require large and expensive works.

The Payette River receives much of its water from heavily timbered areas, where the snow is late in melting, and hence it has a large and fairly constant volume, more than sufficient to irrigate all the agricultural land in the valley through which it flows. It is proposed to divert some of the surplus into the valley of the Weiser, and to use it both along the Weiser itself and south of its mouth along the Snake. The Boise River also is thought to be large enough, with economical use, to reclaim its entire valley. In the southeastern corner of the State water can be taken from the Bear River to water a large tract

¹ Brough, "Irrigation in Utah," p. 106.

of land near Chesterfield and Bancroft at a moderate cost per acre. In other localities much land may be reclaimed by the development of natural reservoir sites. Artesian wells have brought water to the surface, or nearly to the surface, in various parts of the State, and in some places it has been found possible to bring the underground flow out on the land by means of trenches. The amount of irrigable land in the State is estimated by Mr. Newell at 7,000,000 acres;¹ the State engineer makes a more conservative estimate of 4,000,000 or 5,000,000 acres. In 1896 it was estimated that existing canals would irrigate 1,250,000 acres, only one-fourth of which was then actually under cultivation.

The leading industries of Idaho are mining and stock raising. The principal crops thus far have been hay, cereals, and vegetables; but the soil and climate have been found to be well adapted to the cultivation of sugar beets, prunes, apples, peaches, pears, grapes, and cherries. The Snake River Valley has excellent transportation facilities in the Oregon Short Line Railroad, while the northern part of the State is crossed by the Great Northern and Northern Pacific roads.

WYOMING.

Wyoming contains about 49,035,000 acres of public land open to settlement, besides 8,216,643 acres reserved for various purposes. Of the latter amount, 1,897,000 acres are in the Yellowstone National Park, almost an equal amount is in the Wind River Indian Reservation, and 3,241,760 acres are devoted to forestry.

The vacant public land is valuable chiefly for grazing and timber, and in many places for coal, oil, and other mineral products; but there are vast areas which need only irrigation to transform them into very productive farms. The water supply is fairly abundant and well distributed, and is estimated to be sufficient to reclaim 9,000,000 acres. The principal streams available for this purpose are the North Platte River and its tributaries in the southeast, the Green in the southwest, the head waters of the Cheyenne in the northeast, and the Big Horn and Powder rivers, which rise in the central part of the State and flow northward into Montana. There are still some places where land can be reclaimed without great expense by small ditches; but as these places are more than 6,000 feet above the sea level, hay is almost the only important crop that can be depended upon to mature there. The better lands can be reclaimed only by means of reservoirs and large canals, requiring considerable capital; but in the Big Horn basin and elsewhere there are large tracts of public land so situated that the expense of reclamation would be by no means

¹ In the Sixteenth Annual Report of the United States Geological Survey the estimate is only 1,500,000 acres, the difference being made up by additions to North Dakota and South Dakota. The figures quoted in this paper are from Mr. Newell's paper as published separately.

excessive. The best agricultural land in the State is said to be that lying along the Platte River and along the northern border east of the Big Horn Mountains. In nearly all cases the ditches thus far constructed water only the bottom lands near the rivers, leaving the upper bench lands, where the soil is even better, to be reclaimed by more extensive works in the future.

The tillable lands of Wyoming lie from 3,500 to 7,000 feet or more above sea level, higher on the whole than the agricultural land of any other State. There are high mountain ranges in the north and west and a few peaks near the southern boundary. The climate has been found to be well adapted to the cultivation of cereals and grasses, while the raising of hardy fruits is also becoming an important industry. There is a lack of railroad facilities in the central and northwestern part of Wyoming, but the Union Pacific Railroad traverses the southern part of the State, while the eastern part is served by the Northwestern and Burlington systems and by local lines, and the Oregon Short Line enters the southwestern corner.

CALIFORNIA.

In California the vacant public land aggregates 42,443,000 acres, or a little more than the amount which has been appropriated. There are also seven forest reserves, besides the General Grant, Sequoia, and Yosemite national parks, and several small Indian reservations.

Topographically, California consists of the Sierra Nevada and Coast ranges of mountains, with a broad, level valley between them and narrow exterior strips of comparatively low land. Through the central valley flow the Sacramento River in a southerly and the San Joaquin in a northwesterly direction to Suisun Bay and the Golden Gate. Tributary to these rivers are a number of streams which rise in the Sierra Nevadas, while the Klamath in the extreme north and many shorter streams flow directly into the Pacific Ocean. There are also many small streams which contribute their waters to interior lakes or are used up in irrigation near their source in the mountains. There is thus an abundant water supply, and California as a whole can scarcely be called an arid State. The annual rainfall is not very deficient in quantity, but during August, September, and October there is drought; from this it results that while grains can be raised successfully without irrigation in many of the valleys, artificial watering is essential to orchard crops except in the most humid sections. Dry farming has been carried on to some extent in every county in the State, and there is a considerable area along the Sacramento and San Joaquin rivers which is too wet, and where the problem is one of drainage instead of irrigation. The great mass of vacant public land, however, is in the arid southeastern part of the State, east of the forest reservations in the mountains. San Bernardino County, containing a large part of the Mohave Desert, has 7,500,000 acres of

public land, and Inyo County, in which Death Valley is situated, has 5,700,000 acres, including some land on which crops might be raised. In the northern part of the State the largest amounts of public land are in Siskiyou and Lassen counties. In the former there are 2,300,000 acres of mountainous, grazing, timber, mineral, and farming land; nearly five-sixths of the latter county is still public land, much of which is irrigable from Honey Lake, Eagle Lake, and other sources, while the remainder consists of nonirrigable grazing land and mountains, partly timbered. Small amounts of agricultural land are still vacant in a number of other counties.

It is estimated that altogether 17,000,000 acres of California lands are capable of irrigation, but it is doubtful how much of the land now vacant will be reclaimed in that manner; a large part of the available water supply may be used to irrigate lands which have been already cultivated without irrigation. There are, however, projects for reclaiming part of the desert in the extreme southeast, especially near Salton Sink, which, like Death Valley, lies below sea level, and which in 1891 and 1893 was covered by natural overflows from the Colorado. Artesian wells are extensively employed in southern California and in the San Joaquin Valley, and many of the natural reservoir sites have been utilized.

California, as a whole, is fairly well supplied with railroads, and both the Santa Fe and the Southern Pacific systems have lines crossing the large tract of public land in the southeast; but there are some counties in the north and east of the Sierra Nevadas where the development of the fruit industry has been hindered by lack of transportation facilities.

COLORADO.

In Colorado there are still 39,708,000 acres of public land, exclusive of reservations, or nearly twice as much as the amount in private ownership. The public land is mainly in the mountainous western half of the State, where almost none has been appropriated except along the borders of streams; but there is a greater or less amount of it in every county. More or less vacant agricultural land is reported from every part of the State, as well as large areas of grazing and mineral lands, the latter including extensive coal deposits. The vacant land ranges for the most part from 5,000 to 10,000 feet above sea level, but there is a little as low as 4,000 or 4,500 feet, mainly in the east.

The rainfall in Colorado is light, but more than 60 per cent of the total usually occurs during the crop-growing season, so that in good years dry farming is fairly successful in the eastern part of the State. The irrigable area is estimated by Mr. Newell at 8,000,000 acres, of which 890,735 acres were already irrigated in 1889; but State Engineer Cramer computed in 1894 that there were 54,152,000 acre-feet of water available yearly, and that over half the mesa and valley lands, or

more than 20,000,000 acres, could probably be irrigated, while less than 2,000,000 acres were then under cultivation. Considerably more than half of the surface-water supply is on the western slope of the mountains, where most of the public land is situated, but the valleys of the Grand, Yampa, and White rivers and their tributaries are narrow for the most part, and the plateaus are too far above the water to be irrigated without great expense. On the plains east of the mountains the only large rivers are the South Platte and the Arkansas, and the amount of water obtainable at present is not sufficient for the land already under ditch; but by storage of the spring floods and by more careful use of water, with the aid of artesian and other wells, it is expected to extend the irrigated area very materially, and it may be made to include some of the lands now vacant. The Rio Grande, which rises among the mountains in the southern part of the State, already serves to irrigate extensive areas.

The principal agricultural products of Colorado, besides hay, are the common cereals, which are raised both with and without irrigation, and the various fruits of the temperate zone. The western slope is becoming famous for its peach orchards and vineyards. Tobacco has been successfully raised in several counties, and sugar beets can probably be raised on both sides of the mountains, where irrigation is possible. Numerous railway lines afford excellent transportation facilities throughout the State, except in the northwestern corner.

OREGON.

The vacant public land in Oregon amounts to 35,897,000 acres, or more than half the area of the State, besides Indian, forest, and military reservations, which bring the total up to 41,365,000 acres. Nearly all the land owned by individuals is included in a narrow strip along the coast and a somewhat wider strip between the Cascade and Coast ranges, and in a few counties along the northern boundary.

West of the Cascade Mountains the rainfall is so abundant that agriculture is carried on for the most part without irrigation, the Willamette Valley especially being considered an excellent farming country; and there is still a little vacant agricultural land left in this humid portion of the State, in Clackamas and Marion counties in the north, and farther south in Douglas and Coos counties, besides much timber and grazing land among the mountains. East of the Cascade Range is a vast plateau, varying in elevation from about 2,000 to 5,000 feet above sea level, and similar in general character to the plains of Idaho, while south of this is that part of the Great Basin which extends into Oregon. It is in this eastern part of the State that much the greater part of the public lands are situated, and rough estimates show that they include fully 4,000,000 acres of agricultural land, besides large areas of grazing land and timber. Wheat and other cereals are grown here also without irrigation, but not without

risk of failure from lack of rain; and irrigation is practiced to a considerable extent, though mainly as yet by means of short ditches. There are numerous small rivers tributary to the Snake and the Columbia, and while most of the water now runs to waste in the early spring, it is estimated that by constructing reservoirs and using artesian-well waters about 3,000,000 acres in eastern Oregon can be irrigated. Where irrigation is practiced the cereal crops are usually supplemented by the raising of fruits, vegetables, and forage crops. Besides agriculture and stock raising, mining is carried on to some extent in eastern Oregon as well as in the mountains farther west.

There are several railroads in the Willamette Valley, and the Willamette River is navigable throughout more than half its course. Other railroads run along the northern border and across the northeastern corner of the State, but through most of eastern Oregon there are no better means of communication than wagon roads.

WASHINGTON.

In Washington there are now only 13,442,000 acres of vacant public land, an amount considerably less than that which has been appropriated. Indian and forest reservations, etc., make the total public land about 24,573,000 acres. The largest areas of unappropriated land are in the northern, northeastern, and central portions of the State.

Washington is similar to Oregon topographically, being divided by the Cascade Mountains into a coast region with abundant rainfall and a region of semiarid lava plains. The Columbia River flows in an irregular course through the eastern division of the State, and after being joined by the Yakima on the west and the Snake on the east, forms most of the southern boundary. The Columbia flows from about 1,000 to 2,000 feet below the surface of the surrounding plains, so that its waters can not be used to irrigate them; but the Yakima and its tributaries are used to some extent already, and there are excellent reservoir sites near their sources in which sufficient water can be stored to irrigate a large part of the valley, which includes much public land. Some streams elsewhere in the State can also be utilized, and artesian wells are successful near the eastern border, in Spokane and Whitman counties, and also near the foot of the Cascade Mountains. Altogether it is thought that 3,000,000 acres east of the mountains are irrigable. Agriculture is not wholly dependent upon irrigation, however, even east of the Cascade Range. Wheat is raised extensively without artificial watering, especially on the eastern half of the plains, and the irrigated areas are devoted largely to fruits, vegetables, and alfalfa. The vacant public lands include some tracts in the wheat belt, as well as much grazing land and vast mountain areas valuable chiefly for timber and minerals.

Washington is well favored in the matter of transportation, being

crossed by two transcontinental railways, and having a number of local roads in the eastern part. Okanogan County, which contains the greatest area of public land, lacks transportation facilities except along its southern boundary, but Stevens, Douglas, and Kittitas counties, which are next in order, have each two railroads.

NORTH DAKOTA.

The amount of vacant public land in North Dakota, 20,574,000 acres, is nearly equal to the amount which has been appropriated. There are also more than three million acres in Indian reservations. Most of the western half of the State still belongs to the public domain, but in the eastern half the amount of public land diminishes rapidly, and in the valleys of the James and Red rivers, where dry farming is most successful, there is hardly any left. In the western part of the State, where irrigation is most needed, there are only limited areas in which water can be easily secured. The Missouri River is so far below the surface of the arable land and has so slight a fall that its waters can be diverted only with difficulty and at great expense. Some of the Missouri's lesser tributaries, however, especially the short streams flowing from the north, may be made available for irrigation by the construction of storage reservoirs. East of the Missouri River the main dependence is upon artesian wells, which are already in use throughout a large territory for various purposes, and which promise to be of great importance in agriculture. In time much of the public land along the Missouri south of Bismarek will probably be watered in this manner.

The vacant public land is at present of value chiefly for grazing, but it is very fertile for the most part, and wherever irrigation is practicable can be made to produce abundant crops of wheat and other cereals, hardy fruits, etc., as well as forage crops. There is a little timber in the Turtle Mountain region in the extreme north, and deposits of lignite coal are found throughout nearly all the western half of the State.

The public lands in the western part of the State are crossed by the two northern transcontinental railways running nearly east and west, and diagonally by the Minneapolis, St. Paul and Sault Ste. Marie Railway.

SOUTH DAKOTA.

There are 12,784,000 acres of vacant public land in South Dakota, besides the greater part of the Black Hills Forest Reserve and a number of large and small Indian reservations, making the total amount of public land a little less than half the area of the State. There is comparatively little public land left east of the Missouri River, though there are few counties which have none at all; and there is little land open to settlement immediately west of the Missouri, except in Stanley County, because the river is bordered most of the way by Indian

reservations. In the southeastern corner of the State are several small tracts of swampy grazing land, amounting in the case of Charles Mix County to some thousands of acres. Most of the appropriated land in the western part of the State is along the Cheyenne River and the streams which flow into its southern fork from the Black Hills, and the largest areas of vacant land are in the northwestern corner, in the Bad Lands of the southwest, and between the Cheyenne and White rivers. It is thought that by water storage and the use of artesian wells at least 1,000,000 acres of South Dakota lands can be irrigated. There is an extensive and remarkable artesian-well area east of the Missouri, and recent investigations make it seem probable that this area extends also into the public lands of the western and northwestern portions of the State, in which case the estimate of the irrigable area will need to be considerably increased.

South Dakota is an important cattle raising and wheat and corn growing State, and does well in the production of flax. A large part of the State lies in the sugar-beet belt, and fruit raising also promises to be a very profitable industry. South Dakota is well supplied with railroads in the east and in the Black Hills region, but the portion of the State containing most of the vacant land is not easily accessible.

NEBRASKA.

Rather more than one-fifth of Nebraska, or 10,548,000 acres, is still vacant public land. Nearly all of this is in the north central and northwestern parts of the State, and consists mainly of a sandy soil, at present valuable only for grazing. There is a little vacant farming land reported in Custer County, near the center of the State, and there is some timber on public land in Dawes and Sioux counties, in the extreme northwest. Mr. Newell estimates that 1,500,000 acres of the semiarid western part of the State can be reclaimed for agricultural purposes by irrigation; the secretary of the State board of irrigation estimates that altogether 6,000,000 acres can be irrigated. The canals already built and under construction are estimated to cover more than a million acres.

The principal rivers of Nebraska are the Platte and its tributary the Loup, which drain the central part of the State, the Niobrara, which flows along the northern boundary, and the Republican in the south. The flow of the Loup and Niobrara is fairly constant throughout the year. There are also many springs and creeks from which water is easily obtainable. There are many artesian wells in Nebraska, but they are most successful in the northeastern part of the State, where there is now little public land. By the use of windmills or other machinery, however, underground water may be obtained for irrigation on a small scale in central and western Nebraska. The alkali in the soil is sometimes troublesome, especially where too much water is used, but in such cases sugar beets can often be grown with much

benefit to the soil. There are several railways crossing Nebraska, and one of them traverses the region in which is most of the public land.

OKLAHOMA.

The settlement of Oklahoma has progressed so rapidly that more than half the available land has been taken up, leaving only 7,007,000 acres of vacant public land. Nearly all the eastern half of the Territory has been appropriated, but Beaver County, comprising the strip of territory formerly known as "No Man's Land," together with some of the other western counties, is still mainly public land. There are also tracts of vacant land scattered through the central part of the Territory, including some agricultural and grazing land in Custer, Canadian, Woods, and Kingfisher counties. There is also timber in some of the western counties, and there is said to be some good farming land left in Greer County, in the southwest. In the western third of the Territory cattle raising is now the leading industry, the rainfall being often insufficient for farming; but, although the waters of the Cimarron, the Black Bear, and the Salt Fork of the Arkansas are unfit for irrigation, while the North Fork of the Canadian River is considered doubtful, it is estimated that 1,000,000 acres can be irrigated from wells and small streams. Artesian water has been found in Woods County, in the northern part of the Territory. Good crops of wheat and other cereals, cotton, etc., are raised in eastern and central Oklahoma, and wherever irrigation has begun to be employed the climate has been found very favorable to fruit raising. Cotton is successfully grown in the southern part. For a new country Oklahoma is well supplied with railroads, for there are a number crossing the eastern half of the Territory and one running diagonally across Woodward and Woods counties, while several more lines are more or less definitely projected.

KANSAS.

In Kansas there are only about 1,060,000 acres of vacant public land, this being but 2 per cent of the total land area, and a much smaller amount than in any other State so far west. It is nearly all in the western end of the State, the eastern half having only a few thousand acres of public land all told, and of poor quality. The vacant land is for the most part broken or rough grazing land, though some agricultural land is reported.

The principal streams of western Kansas are the Arkansas and Cimarron rivers in the south, the headwaters and tributaries of the Republican and Solomon in the north, and between these, the Smoky Hill River and its tributary the Saline. Especially in the extreme west, where irrigation is most necessary, the streams are either very small or often dry during the summer, and hence are of little value to agriculture without a system of storage. It is evident that water must be obtained very largely from underground by means of pumps,

which are already in use in many places, being driven either by wind or by gasoline or steam engines. The underground water is usually found near the surface and seems to be extremely abundant; and in the southwestern part of the State, especially in Meade and Hamilton counties, there are many successful artesian wells. It is probable that this underground supply will ultimately be used throughout western Kansas to irrigate a small area on each farm. Mr. Robert Hay, chief geologist of the United States artesian and underflow investigation, estimated that the underflow in this part of the State was sufficient to irrigate from 5 to 20 acres in each quarter section; while Mr. W. G. Russell, an assistant hydrographer for the United States Geological Survey in charge of the Kansas measuring stations, relies upon the rivers to water about 28 acres to a section. The president of the State Board of Irrigation Survey and Experiment estimates that altogether about one-sixth of western Kansas is irrigable; Professor Haworth, of the Kansas State University, calculates that from all sources more than half the total area of the State can be irrigated.¹ Mr. Newell's estimate allows nothing for Kansas, so that whatever area is found to be irrigable must be added to his total of 74,000,000 acres.

MINNESOTA.

There are still 5,720,000 acres of vacant public land in Minnesota, besides about 400,000 acres of Indian land opened to settlement since June, 1898. The vacant land is mainly in the extreme north, in the rather inaccessible region north and east of the Red Lake Indian Reservation; about one-half the whole amount is in the two counties of Beltrami and Itasca, large areas of which are still unsurveyed. Much of the public land in this part of the State is covered with timber, including pine, spruce, poplar, and hard woods, and a part is swampy; but there is also some which lacks only transportation facilities to make it valuable for farming. There are also unworked mineral deposits in Itasca, Saint Louis, Lake, and Cook counties; they are chiefly of iron, but there is a gold-bearing formation in the northern part of Itasca County, and nickel in the extreme northeast of the State. West of Duluth, in the country around Leech Lake and Millelacs, there are many thousand acres of timber, brush, and swamp; but the only public land in the southern half of the State is in small isolated tracts.

ARKANSAS.

Scattered through nearly every part of Arkansas are tracts of public land aggregating 3,696,000 acres, or more than one-tenth of the area of the State. Throughout eastern Arkansas the vacant land is timbered

¹ Seventh Biennial Report of the Kansas State Board of Agriculture, 1889-90, p. 133; Ninth Biennial Report, 1893-94, p. 333; Report of the Board of Irrigation Survey and Experiment, 1895-96, pp. 186, 190.

and partly swampy, with a little grazing land in Arkansas, Lonoke, and Prairie counties; in the southwest it is swampy for the most part, with a few thousand acres of timber in Ouachita County; while in the central and northwestern parts of the State it consists mainly of hills and low mountains, which are partly covered with timber, and among which there is some well-watered agricultural land.

FLORIDA.

The vacant Government land in Florida, not including the swamp lands granted to the State, amounts to 1,757,000 acres, or nearly 5 per cent of the entire land area. About one-third of this amount is in the northwestern extremity of the State, lying between Alabama and the Gulf of Mexico, the largest amounts being in Walton and Washington counties; the remainder is scattered about on the peninsula, and, except at the southern end, mainly in small tracts. The public domain in Florida consists mainly of low-lying pine land, with some swamps and marshes not yet selected by the State government. Extensive deposits of phosphates are found on the western half of the peninsula, and at the southern end there is a little rocky land of no apparent value.

LOUISIANA.

There are 755,000 acres of public land in Louisiana, besides nearly 1,475,000 acres reserved from settlement. Most of the vacant land is covered with pine, but there is some swampy land, especially in the extreme southeast, and there are several thousand acres of open prairie in the south and southwest. Along the Mississippi there is still some farming land to be had, with rich alluvial soil, but subject to occasional damage by floods. In the northwestern part of the State the land still available is sandy, with more or less clay.

ALABAMA.

The vacant public land in Alabama amounts to about 522,000 acres. It is mainly in the hilly or mountainous region which makes up the northern part of the State, and part of the remainder is sandy or barren; but there are also many thousand acres of unappropriated pine timber scattered through the southern half of the State, besides a little hard wood, and some marshy lands on either side of Mobile Bay which ought not to be very difficult to drain. Some agricultural land is reported in Clarke County, lying between two navigable rivers and less than 100 miles from Mobile; also a small tract of hilly farming land in Barbour County.

MICHIGAN.

The vacant public land in Michigan amounts to about 505,000 acres, scattered through the Upper Peninsula and the northern end of the Lower Peninsula. In the Upper Peninsula it is in large part sandy soil, partly covered with timber, mainly beech, birch, and hard

maple, with some pine, spruce, and hemlock. There is no unappropriated timber on the Lower Peninsula except a small amount in Kalkaska County; much of the remainder is a fair quality of agricultural land with light soil. The largest areas of public land in this part of the State are in Oscoda, Gladwin, Iosco, Montmorency, Crawford, and Presque Isle counties.

MISSOURI.

The public land in Missouri amounts to 445,000 acres, situated wholly in the southern half of the State, and mainly in the extreme south and southwest. It is nearly all rough or hilly land, covered with timber for the most part, but near the center of the southern half of the State, especially in Dallas, Laclede, and Pulaski counties, there is some open grazing land. There are said to be also some tracts suitable for fruit growing, and others probably containing mineral deposits of various kinds.

WISCONSIN.

Wisconsin contains only about 413,000 acres of public land, besides several small Indian reservations. The greater part of the vacant land is in the forest region comprising the eleven or twelve northernmost counties. The timber is partly pine and partly hard wood, and varies from dense forest to scattering woodland; there are also considerable areas of swampy land. There are several thousand acres of public land as far south as Adams, Juneau, and Monroe counties, but most of this is covered by a scattering growth of small oak trees, and the soil of the remainder is of poor quality.

MISSISSIPPI.

The public land in Mississippi amounts to only 383,950 acres. It is scattered throughout the State, except in the extreme north, but is mainly in the southeast corner and in Wilkinson and Franklin counties in the southwest. It is officially described as agricultural and timber land.

ALASKA.

Almost the entire area of Alaska is still public land, the only portions filed upon up to the close of the last fiscal year being less than 3,000 acres of mineral land, one town site, and a few small tracts used for manufacturing or commercial purposes. The inhabitants are now occupied mainly in mining, fishing, and fur hunting, but in the coast region of southeastern Alaska agriculture is expected to become of more and more importance. The temperature along the coast is very moderate for that latitude, with no violent fluctuations; the soil is fertile, though sometimes requiring to be drained; the rainfall is abundant, and there is a vast quantity of accessible timber. Grasses, vegetables, berries, wheat, and some other crops are already grown to a slight extent, and stock raising is practiced on a small scale.

HAWAII.

The Government lands in the Hawaiian Islands, including those formerly classed as Crown lands, amounted in August, 1898, to about 1,772,640 acres, of an estimated value of \$5,581,000. The lands at present under lease yield a revenue of something over \$100,000 a year. It is estimated that there are about 70,000 acres of public land suitable for coffee growing, which is said to be the coming industry of Hawaii, about 25,000 acres of cane lands, and nearly 1,000 acres of rice lands, besides 451,000 acres now used only for grazing and 681,000 acres of forest. Most of the remainder is either barren or mountainous, with the exception of 145 acres of valuable city lots in Honolulu and Hilo. About two-thirds of the Government land is on the island of Hawaii, the remainder being scattered about on the other islands of the group.

PUERTO RICO AND PHILIPPINE ISLANDS.

There are public lands in Puerto Rico from which some revenue has been derived in the past, but no exact information concerning their extent or character is available.

A very large part of the Philippine Islands is either uninhabited or inhabited only by wild tribes.

THE LAND LAWS.

The vacant public lands of the United States are open to settlement under various acts of Congress, the main provisions of which, together with some of the most important regulations made thereunder, are here briefly summarized:

HOMESTEADS.

Any citizen of the United States or any person who has declared his intention of becoming such, who is the head of a family, or has attained his majority, or has served in the Army or Navy in time of war, and is not already the proprietor of more than 160 acres of land in any State or Territory, is entitled to enter a quarter section (160 acres) or any less amount of unappropriated public land, and may acquire title thereto by establishing and maintaining residence thereon and improving and cultivating the land for a period of five years. In grazing districts stock raising and dairy farming are accepted in lieu of cultivation of the soil. Each homestead entryman is required to make affidavit that the application is made honestly and in good faith for the purpose of actual settlement and cultivation, and not for the benefit of any other person or corporation or for the purpose of speculation. Persons who served as soldiers or sailors of the United States in the civil war are entitled to have their period of service deducted from the homestead period of five years, and those who were discharged from service on account of wounds or disabilities may have the whole period of enlistment deducted; but

at least one year's residence is required in all cases. Homestead settlers not wishing to complete the five-year term of residence may obtain title to the land by paying for it in cash after a residence of not less than six months. In other cases, with the exception of certain lands formerly reserved for the use of Indians, the only payments required are certain fees and the cost of publishing notice of final proof. The fees for 160 acres of land in States lying east of the one hundred and fourth meridian amount to \$14 at the time of making application and \$4 at the time of making final proof; in the States and Territories lying farther west the corresponding payments are \$16 and \$6, respectively. When "double minimum" lands are entered the payments are somewhat higher. In the case of certain lands in Oklahoma, homestead settlers are required to pay from \$1 to \$2.50 an acre in addition to the usual fees; on the Chippewa lands, in Minnesota, they are required to pay \$1.25 an acre; and on what was formerly the Great Sioux Indian Reservation, in Dakota, they are now required to pay 50 cents an acre, besides the fees.

DESERT LANDS.

A resident citizen of any of the arid-land States or Territories may obtain title to 320 acres or less of desert land therein by paying \$1.25 an acre, by expending at least \$1 an acre each year for three years in reclaiming the land by irrigation, in the purchase of water rights, and in permanent improvements, and by cultivating one-eighth of the land. One-fifth of the purchase money must be paid at the time of filing the application and the remainder at the time of making final proof, at any time within four years; the applicant must also pay for the publication of notice of final proof. The application must be accompanied by a map or plan of the land, showing the mode of irrigation proposed and the source of the water to be used, and at the expiration of the third year another map or plan must be filed, showing the character and extent of the improvements. Proof must also be given each year that at least \$1 an acre has been expended in reclaiming the land. Any number of persons entering separate tracts may associate together in the construction of canals or ditches for irrigation, and may file joint maps.

The legal definition of desert land is "all lands exclusive of timber lands and mineral lands which will not, without irrigation, produce some agricultural crop." It thus includes lands naturally suitable for grazing, as well as deserts in the usual sense of the word. The desert-land law applies only to public lands in the States of California, Nevada, Oregon, Washington, Idaho, Montana, Utah, Colorado, Wyoming, North Dakota, and South Dakota, and the Territories of Arizona and New Mexico. No patent will be issued under this law to any person or association that already holds more than 320 acres of arid or desert land.

GRANTS OF DESERT LAND TO THE STATES.

The so-called "Carey act," which is really section 4 of the sundry civil act of 1894, as amended by the corresponding act of 1896, provides for the donation to each of the arid-land States of 1,000,000 acres of desert land, conditioned upon the reclamation of the land so granted by irrigation. Each State applying for land under this section is required to file a map of the land showing the proposed mode of irrigation and the source of the water. As fast as the lands are irrigated patents will issue either to the States or to their assigns; but no State is permitted to dispose of more than 160 acres to any one person, and any excess of the proceeds above the cost of reclamation is to be applied to the reclamation of other desert lands.

TIMBER AND STONE LANDS.

Public lands valuable chiefly for timber or stone and unfit for cultivation may be sold to citizens of the United States or persons who have declared their intention to become such, in quantities not exceeding 160 acres to each person or association, at \$2.50 an acre.

ISOLATED TRACTS.

Isolated tracts of less than a quarter section of public land, which have been subject to homestead entry for three years after the surrounding lands have been appropriated, may be advertised for sale by order of the Commissioner of the General Land Office. Any person wishing to purchase an isolated tract must file in the district land office an affidavit describing the land and pay for the advertisement. Thirty days' notice is required after the land is ordered into the market, after which it is sold at public sale to the highest bidder, but not for less than \$1.25 an acre. The amount which any person may purchase in this manner is limited to 160 acres.

PRIVATE ENTRY, PUBLIC SALE, ETC.

Public lands of the United States situated in the State of Missouri are still subject to private entry, and hence may in general be purchased at the rate of \$1.25 an acre; but the alternate reserved sections within the limits of railroad grants, with certain exceptions, are held at the "double minimum" price of \$2.50 an acre. Certain lands in other States, including the Osage Indian trust and diminished-reserve lands in Kansas, are also subject to private entry under special laws.

No public lands are now sold at auction except isolated fractional tracts, abandoned military and other reservations, and mineral and other lands authorized to be sold at auction by special acts of Congress.

No person is permitted to acquire title to more than 320 acres of public land, agricultural in character, under all the land laws.

The preemption and timber-culture laws have been repealed, except as to claims instituted before March 3, 1891.

INDIAN LANDS.

The President is authorized to allot lands in Indian reservations to the Indians in severalty, in amounts of one quarter section to each head of a family, one-eighth of a section to each single person over 18 years of age and each orphan under 18, and one-sixteenth of a section to each other single person under 18 years. When the lands are valuable for grazing only, double allotments are provided for. The United States holds the land in trust for the benefit of the allottees for twenty-five years, during which it can not be alienated; at the expiration of that time the land is conveyed in fee to the original allottees or their heirs. The Indian Territory, the reservations of the Seneca Indians in New York, and a certain strip of territory in Nebraska adjoining the Sioux Nation on the south, are excepted from these provisions.

Any portion of a reservation ceded by the Indians to the United States, adapted to agriculture with or without irrigation, is to be disposed of only under the provisions of the homestead law.

MINERAL LANDS.

Mineral lands are excepted from the provisions of the law relating to other public lands, but all valuable mineral deposits in the public lands are open to exploration and purchase by citizens of the United States and those who have declared their intention to become such, and by associations of such persons, under the mining laws and the local customs or rules of miners. Mining claims in general are of two classes, lode claims and placers. In the case of mining claims on veins or lodes of rock bearing valuable deposits, the maximum surface area permitted by law is a space of 1,500 by 600 feet. Labor must be performed or improvements made to the extent of at least \$100 during each calendar year after that in which the claim is located until entry is made and the patent certificate issued. A patent may be obtained after the performance of labor or completion of improvements to the amount of \$500 on payment of \$5 for each acre or fraction thereof, the applicant paying also for publishing the notice of application. Mill sites on nonmineral land, not exceeding 5 acres in extent, may also be obtained at the rate of \$5 an acre, and may be applied for and patented with the lode claim proper.

Placer-mineral claims are subject to entry and patent upon the same conditions as to labor and improvements, but the price is only \$2.50 an acre. Placer claims on surveyed land must conform to the legal subdivisions of the public lands (including for this purpose 10-acre tracts), and the maximum size is 160 acres for an association or 20 acres for each individual. Lands chiefly valuable for petroleum or other mineral oils may be acquired under the provisions of law relating to placer-mineral claims, and lands chiefly valuable for building stone may be acquired either by placer entry or under the law relating to timber and stone lands.

Mineral lands in Michigan, Wisconsin, Minnesota, Missouri, Kansas, and Alabama are excepted from the provisions of the general mineral land law, and are either offered at public sale or disposed of in the same manner as agricultural lands.

Coal lands are sold for \$10 an acre, or \$20 an acre if situated within 15 miles of a completed railroad. The maximum amount which may be purchased by an individual is 160 acres; but associations of four or more persons which have expended \$5,000 or more in improving and working a mine may enter as much as 640 acres.

Saline or salt-spring lands, except in certain States and Territories which have never received grants of saline lands by act of Congress, may be sold at public auction for not less than \$1.25 an acre, and if not sold when so offered they become subject to private sale at the same minimum price.

TOWN SITES.

Title to public lands comprised in town sites may in general be acquired in either of the three ways described below:

(1) The President is authorized to reserve from the public lands town sites at any natural or prospective centers of population. The town lots are offered for sale at auction, and those not sold in that manner are held subject to private entry; but in no case may a lot be disposed of for less than its appraised value.

(2) When any persons have founded or desire to found a city or town on the public domain they may file with the county recorder a plat for not more than 640 acres, together with a statement of the extent and character of the improvements, transcripts of which are transmitted to the General Land Office and to the district land office. The lots may then be offered at public sale by order of the President, subject to a minimum price of \$10 a lot, and those not so disposed of are thereafter subject to private entry at the same minimum price or at such reasonable increase or diminution as the Secretary of the Interior may order in view of the increase or decrease in the value of property. Before the day fixed for the public sale actual settlers are entitled to purchase the lots which they have improved at the minimum price. If no transcript map and statement are filed in the General Land Office within twelve months from the establishment of a town or city on the public domain, the Secretary of the Interior may cause the survey and plat to be made, in which case the minimum price of lots is \$15. The usual minimum is also increased in the case of lots containing more than 4,200 square feet.

(3) Whenever any portion of the public lands is settled upon and occupied as a town site, the corporate authorities, or if the town is not incorporated, the judge of the county court, may enter the land so occupied at the proper land office, at the minimum price, in trust for the benefit of the several occupants, in which case the sale of lots

and the disposition of the proceeds are conducted as prescribed by the State or Territorial legislature.

In Oklahoma town sites are entered by boards of trustees appointed by the Secretary of the Interior, and must contain reservations of from 10 to 20 acres for parks, schools, and other public purposes.

ALASKA.

The homestead land laws of the United States, with some additional limitations, were extended to Alaska by the act of May 14, 1898. No homestead in that district may exceed 80 acres in extent or extend more than 80 rods along the shore of any navigable water; and along such shores every alternate space of 80 rods is to be reserved from entry. Any citizen of the United States or any association of such citizens occupying public lands in Alaska for the purposes of trade, manufacture, or other productive industry, which is needed for such purposes, may purchase not exceeding 80 acres of such land, not including mineral or coal lands, at \$2.50 an acre, upon submitting proof that the area embraces improvements made by the claimant. Alternate spaces of 80 rods in width abutting on navigable waters are to be reserved, but the use of such reserved lands may be granted to citizens or associations for landings and wharves. Suitable tracts of land are also to be reserved as landing places for the natives. The Annette and Pribilof islands and the islands used for the propagation of foxes are excepted from the provisions of the act.

The Secretary of the Interior may sell timber from public lands, to be used in Alaska only, at an appraised value, but such sales must be limited to the actual necessities of consumption in Alaska from year to year. Actual settlers, miners, etc., are permitted to use limited amounts of timber for firewood, buildings, and certain other purposes free of charge.

The laws of the United States relating to mining claims are in force in Alaska, and town sites may be entered for the benefit of the occupants by trustees appointed by the Secretary of the Interior.

HAWAII.

The land laws of the United States have no application in Hawaii, and no provisions have yet been made for the disposition of public lands there; but it is provided in the joint resolution of annexation that all revenue or proceeds from such lands, exclusive of those occupied for civil, military, or naval purposes or assigned to the use of the local government, shall be used solely for the benefit of inhabitants of the Hawaiian Islands for educational and other public purposes.